Oregon
John A. Kitzhaber, MD, Governor

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October 29, 2015

Stuart Dearden
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Bridgewater, NJ 08807-0800

Re: DEQ Review "Feasibility Study Work Plan Former Rhone Poulenc Site"
RP-Portland Site
ECSI 155

Dear Mr. Dearden:

The Oregon Department of Environmental Quality (DEQ) has completed our review of the July 8, 2013 *Feasibility Study Work Plan Former Rhone-Poulenc Site – Portland Site*, prepared for StarLink Logistics Inc. (StarLink) by Golder Associates. Thank you for the submittal. As we've discussed previously, DEQ's review of this 2013 document was purposefully delayed in order to complete the remedial investigation report and our comments on the submitted risk assessment documents. Please submit a revised work plan to DEQ to address the following comments within 90 days.

General Comments

The revised submittal must be consistent with DEQ's conclusions and directions regarding the *Rhone-Poulenc Remedial Investigation Report: Addendum RI/SCE Report*[1] (RI/SCE Addendum), Revised Final Human Health Risk Assessment[2] (On-Property HHRA), and the to-be-revised *Off-Property Screening Level Human Health Risk Evaluation*[3] (Off-Property HHRA). DEQ's conclusions regarding nature and extent, contaminants of concern (COCs) and pathways need to be incorporated throughout the document.

Please note that the following minimum requirements of the feasibility study (FS) work plan, presented in the Scope of Work (SOW) attached to the Consent Order (see Attachment 1), were not fully addressed and should be included in the revised submittal:

1. A summary of the current and reasonably likely future beneficial uses of groundwater and surface water in the locality of the facility (LOF).

[1] (DEQ 2015). *Rhone-Poulenc Remedial Investigation Report*: Addendum-RI/SCE Report (November 19, 2010). Oregon Department Of Environmental Quality. April 2015.
[2] (AMEC 2012). Revised Final Human Health Risk Assessment, Rhone-Poulenc Portland Site, Portland, Oregon. Prepared by AMEC Earth & Environmental, Inc., submitted to Oregon Department of Environmental Quality, June 25, 2012.
[3] (Golder 2013). RE: Off-Property Screening Level Human Health Risk Evaluation Former Rhone-Poulenc Portland Site, Portland, Oregon. Prepared by Golder Associates Inc., submitted to Oregon Department of Environmental Quality, October 7, 2013.

2. A summary of the current and reasonably likely future land use in the LOF.
3. Proposed contaminant concentration levels for all COCs that meet preliminary remedial goals.
4. A preliminary volume estimate for each environmental medium impacted by COCs.
5. A preliminary estimate of hot spot volumes for soil and groundwater.

EPA has also reviewed the FS work plan in the context of source control for the Portland Harbor Superfund Site. Their comments are generally consistent with DEQ comments and should be considered in the revised submittal. EPA's comments are presented in Attachment 2.

Specific Comments

1. **Title.** The title of the FS work plan should be changed *to Feasibility Study Work Plan – Operable Unit 1, Former Rhone Poulenc Site* to identify which portion of the Rhone Poulenc site (the Site) is being addressed. The North Doane Lake (NDL) portion of the Site has been identified as Operable Unit 2 by DEQ.
2. **Page 3, Section 2.0 Background.** It is unclear what portion of the LOF is being addressed in the work plan. Please revise the work plan to describe what areas of the LOF are included and what areas are not. For areas/media that are not included (e.g., NDL and the Willamette River), an explanation of the anticipated actions to address these receptors must be presented.
3. **Page 3, Section 2.1 Location.** Please describe the various forms of herbicide and insecticide production wastes that were disposed or released in the Lake Area Drainage Ditch (LADD) and in the Northwest Property Area (NPA), including liquids/solids in drums, dry material in other containers, etc.
4. **Page 4, Section 2.2 Summary of Previously Completed Interim Remedial Actions and Treatability Studies.** Please describe all interim remediation activities (IRAMs) that have been implemented to date or are planned, and the relationship of the interim actions to preliminary remedial action objectives (RAOs) and potential remedial alternatives. In addition, we note that information regarding the East Doane Lake IRAM, the Lake Area Pilot Study, and the North Front Avenue Groundwater Extraction Extended Pumping Test was not included in the summary. These three actions/investigations significantly inform the FS and should be summarized in the revised work plan.
5. **Page 6, Section 3.0 Identification of Remedial Action Areas.** DEQ's conclusions regarding the Source Control Evaluation and results from the North Doane Lake risk assessments need to be incorporated when identifying remedial action areas as they pertain to upland source control to these surface water bodies.
6. **Page 6, Section 3.0 Identification of Remedial Action Areas.** This section summarizes results from the On-Property HHRA for each exposure unit. However, it does not identify the areas or volume of media which require remedial action. Please revise the work plan to identify the areas and volumes of media which require remedial action for all exposure units across the Site (per the Consent Order requirements). Supporting figures delineating

the extent of unacceptable risk associated with the various COCs, pathways, and media need to be included. If appropriate, figures can be limited to COCs that exceed hot spot threshold levels and be combined with the figures developed to support the preliminary hot spot evaluation. Please see Comment #41 for additional guidance.

7. **Page 6, Section 3.0 Identification of Remedial Action Areas.** As provided in DEQ's November 1, 2006 FS guidance, it is useful to assemble alternatives on a media-specific or area-specific basis for complex sites. Considering the complexity of the Site, please organize the Site into geographic subareas in sufficient detail for evaluation in the feasibility study. Please present the applicable factors for each geographic subarea, such as media, COCs, risk/contamination levels, relevant pathways, depth and mobility of contaminants, engineering constraints, and current and potential future land use.

8. **Page 6, Section 3.0 Identification of Remedial Action Areas.** Current tables summarizing COCs by receptor and area, such as Table 9A through 9D from the On-Property HHRA need to be presented in the revised submittal for the on-property, off-property, and source control areas of the Site.

9. **Page 6, Section 3.1 Summary of Revised Final Human Health Risk Assessment.** Please revise the receptor and COC list in this section to be consistent with the final On-Property HHRA and identify all risk drivers for all exposure pathways.

10. **Page 8, Section 3.2 Summary of Off-Site Human Health Risk Evaluation.** Please include a summary of DEQ's source control evaluation conclusions as presented in the RI/SCE Addendum to identify source control COCs and pathways in this section.

11. **Page 10, Section 3.3.2 NAPL**. Please revise the extent of NAPL at the Site to be consistent with the RI/SCE Addendum. All locations where NAPL has been observed in borings, wells or test pits must be shown on a revised figure in addition to StarLink's and DEQ's (if different) interpretations.

12. **Page 12, Section 4.1.2 Identifying ARARs.** Please incorporate ecological screening level values (SLVs) from the NDL Ecological Risk Assessment and the site-specific source control SLVs in the revised work plan.

13. **Page 13, Section 4.2 Identification of Remedial Action Objectives**. As provided in DEQ's FS guidance and as required by the Consent Order, RAOs need to specifically address the following:

    - The contaminants of concern (COCs)
    - Exposure routes and receptors
    - Risk-based concentrations (RBCs) for human and ecological receptors
    - Hot spot concentrations (hot spot threshold levels)

    The submittal presents generalized RAO's but does not present RBCs and hot spot threshold levels for each exposure route and receptor type. In addition, the Consent Order

requires that the FS work plan present proposed contaminant concentration levels (site specific RBCs) that meet preliminary remedial goals for all COCs.

Please revise the work plan to present narrative RAOs, which reference the appropriate numerical RAOs. Due to the number of COCs and pathways, summary tables of numerical RAOs for all COC/media/pathway/receptor combinations should be presented with an explanation of how they were derived.

14. **Page 13, Section 4.2 Identification of Remedial Action Objectives.** Please present RAOs that specifically address DEQ's conclusions on the source control evaluation in the revised submittal, in addition to the following pathways described in RI/SCE Addendum:

    - Overland stormwater flow into City Outfall 22B
    - Preferential groundwater pathway via City Outfall 22B system
    - Direct groundwater discharge to the Willamette River
    - Preferential groundwater pathway via Saltzman Creek Outfall system

15. **Page 13, Section 4.2 Identification of Remedial Action Objectives.** Please define the RAOs to specifically address the protection of North Doane Lake associated with the groundwater discharge pathway in the revised work plan.

16. **Page 14, Section 4.4 Identification and Screening of Remedial Technologies**. It is unclear from the text if the list of potentially suitable remedial technologies identified is intended to be a complete list of technologies that will be evaluated in the FS. For example, only one treatment option (soil-vapor extraction) is presented for hot spot soil.

    As provided in DEQ's FS guidance, remedial technologies should be screened based on a cursory evaluation of the technology relative to the remedy selection balancing factors. Those remedial technologies that are clearly not feasible should be eliminated from further consideration and documented in the FS report. Table 2-3 of the FS guidance provides an example format for presenting identified remedial technologies and screening criteria.

    DEQ notes that Woodward-Clyde Consultants submitted an initial screening of remedial technologies for the Rhone-Poulenc facility in the July 5, 1995 *Technical Memorandum #2 Preliminary Screening of Technologies.* The summary figures for that submittal are presented in Attachment 3. In this preliminary screening, nine treatment options were identified as potentially applicable for soils; thermal desorption, on-site incineration, off-site incineration, slurry-phase bioreactors, land farming, composting, solidification/stabilization, and dewatering soil washing.

    Please present a broader list of technologies for screening in the revised work plan.

17. .**Page 19, Section 6.0 Data Needs**. The revised FS work plan must include a sampling plan to address all data collection required to address uncertainty noted by DEQ in the RI/SCE Addendum, and to respond to DEQ comments to the On-Property HHRA, and the to-be-revised Off-Property HHRA. The sampling plan needs to include a

comprehensive plan addressing groundwater and soil across the site. For example; Section 4.12 Potential Feasibility Study Data Gaps of the *RI/SCE Addendum*; Specific Comment #9 of DEQ's July 2, 2015 review of the *Revised Final Human Health Risk Assessment*; and Specific Comment #4 of DEQ's August 25, 2015 review of *the Off-Property Screening Level Human Health Risk Evaluation* all present specific data gaps identified by DEQ.

Appendix A Preliminary Hot Spot Evaluation

18. **Page 3, Section 2.1 Soil Data Sets and Screening Criteria.** COI's with Koc >20,000 L/kg were excluded from "highly mobile". Please revise the preliminary hot spot evaluating all COCs regardless of Koc. Additional guidance on evaluating the highly mobile soil spot is presented in Comment #21.

19. **Page 2, Section 2.1 Soil Sets and Screening Criteria.** The detected concentrations of contaminants in soil were screened against the lowest ODEQ-published criteria for occupational worker, construction worker, or excavation worker. Hot spots need to be identified consistent with the individual pathways evaluated in the Site's risk assessments, not just the lowest published criteria. Also, highly concentrated hot spots are determined using the numerical hot spot threshold levels that must be developed consistent with DEQ's Comment #13 regarding Section 4.2 of the work plan. For contaminants that were not identified as COCs, the SLVs used in the risk assessments should be used. In most cases these values are likely to be the same ODEQ-published criteria used by StarLink in the draft work plan. However, if site-specific SLVs were used in the risk assessments, those values should be carried through the FS and the preliminary hot spot evaluation.

20. **Page 3, Section 2.1 Soil Data Sets and Screening Criteria.** A 20x dilution attenuation factor (DAF) was used based on the "DEQ-directed" approach at Arkema (June 25, 2012 Hot Spot Evaluation Update, Arkema Facility). However, sufficient rationale has not been provided to justify why this approach is also applicable at the Rhone-Poulenc site. Nor does the work plan provide sufficient information on the site-specific assumptions or calculations used by StarLink. Please provide sufficient information (i.e. equations, input parameters, figures, etc.) so that DEQ can fully review the highly mobile soil hot spot evaluation in the revised submittal.

    To support a refined approach to identify highly mobile hot spot soils, please identify the maximum likely extent of potential highly mobile soil hot spot areas as follows:

    1. Identify the current and reasonable likely future beneficial uses of groundwater (i.e. groundwater discharge to NDL, groundwater discharge to Willamette River, industrial use of groundwater, etc.).

    2. Determine the appropriate "reference value." The reference value is the significant adverse effect level for the beneficial uses of water to which the hazardous substance would be reasonably likely to migrate (i.e. site specific

industrial water use risk PRGs, or North Doane Lake and Willamette River SLVs (AWQCs, surrogates, etc.).

3. Identify the "point of reference." The point of reference is the location where an exceedance of the "reference value" would result in a significant adverse effect to the beneficial uses of water (i.e. Colluvial Alluvial Gravel/Columbia River Basalt Group [CAG/CRBG] Groundwater, North Doane Lake pore water, Willamette River pore water, etc.).
4. Delineate the extent of groundwater plume that exceeds the "reference value" upgradient of the "point of reference".
5. Finally, delineate the foot print of soil with detected concentrations of the contaminant within the "reference value" exceedance area.

The area of detected concentration in soil within the groundwater plume exceeding the "reference value" is the potential highly mobile soil hot spot area unless additional justification is provided.

The highly mobile soil hot spot area can be further refined if the groundwater plume and detected soil hot spot footprint do not correlate. For example: 1) If the size of the groundwater plume indicates that the source area is smaller than the maximum extent of detection in soil then the use of a soil/water partition equation and DAF is appropriate or 2) If the site plume indicates that the source area is larger than the maximum extent of detected soil, expanding the highly mobile soil hot spot area based on known site characteristics or data gaps using professional judgment and other lines of evidence is appropriate.

In situations where NAPL is present, the extent of NAPL and groundwater flow must be considered when refining the highly mobile soil hot spot area. Best professional judgment can be used to determine if areas outside of the NAPL extent could result in exceedances of a reference value.

21. **Page 3, Section 2.1 Soil Data Sets and Screening Criteria.** StarLink compared the mobility-based criteria to DEQ's Table 40, Table 20, and HHRA screening values for basalt zone groundwater. Potential hot spots need to be identified consistent with the individual pathways evaluated in the Site's risk assessments. Also, preliminary hot spots are evaluated using numerical hot spot threshold levels that must be developed consistent with DEQ's Comment #13 regarding Section 4.2 of the work plan. In addition to using Table 40, Table 20, and HHRA screening values for basalt zone groundwater, SLVs from the North Doane Lake risk assessments, and source control evaluation to address the beneficial use for surface water also need to be used in developing the hot spot threshold levels.
22. **Page 3, Section 2.3 Water Data Sets and Screening Criteria**. Considering the preferential flow of groundwater along the City Outfall 22B system to the Willamette River, please screen shallow groundwater in the vicinity of the Outfall 22B as part of the preliminary hot spot evaluation. Shallow groundwater exceeding hot spot threshold

values with the potential to migrate along the City Outfall 22B system is considered a potential groundwater hot spot.

23. **Page 4, Section 2.3 Water Data Sets and Screening Criteria.** The data set used to evaluate the groundwater discharge of COCs to surface water needs to be expanded to include riverbank well data within the Rhone Poulenc LOF in the ACG-CRBG and deep alluvium, consistent with DEQ's conclusions presented in the RI/SCE Addendum.

24. **Page 4, Section 2.3 Water Data Sets and Screening Criteria.** Evaluation of groundwater discharge to the river was limited to dichlorprop, 2,4,5-TP (silvex), chlorobenzene, 1,2-dichlorobenzene, 1,3- dichlorobenzene 1,4- dichlorobenzene, trichloroethene, and vinyl chloride. Based on the RI/SCE Addendum, please include benzene as an additional COC to be evaluated.

25. **Page 4, Section 2.3 Water Data Sets and Screening Criteria**. Please use site-specific hot spot threshold levels consistent with DEQ's Comment #13 on Section 4.2 of the work plan when determining the extent of potential groundwater hot spots instead of applying the human health screening levels established in the Revised Final HHRA to evaluate the future industrial use of groundwater.

26. **Page 4, Section 2.3 Water Data Sets and Screening Criteria.** Please use site-specific hot spot threshold levels consistent with DEQ's Comment #13 on Section 4.2 of the work plan when determining the extent of potential groundwater hot spots instead of using the JSCS values to evaluate the groundwater discharge to the Willamette River pathway.

27. **Page 4, Section 2.3 Water Data Sets and Screening Criteria.** Please use site-specific hot spot threshold levels consistent with DEQ's Comment #13 on Section 4.2 of the work plan should be used in evaluating potential groundwater hot spots. In addition to using Table 40, Table 20; please use SLVs from the North Doane Lake risk assessments when developing the hot spot threshold levels to evaluate the groundwater discharge to NDL pathway.

28. **Page 6. Section 3.1.1 Risk-based Evaluation.** COIs with "sporadic or isolated detections" were inappropriately excluded from the risk-based hot spot evaluation. All soil samples that exceed hot spot levels must be identified as hot spots. Based on text in Section 3.1.1 the following COIs were inappropriately excluded:

    - PCDDs/PCDFs: 1,2,3,7,8-PeCDD, 1,2,3,7,8-PeCDF, and 2,3,7,8-TCDF
    - Inorganics: mercury
    - OCIs: 4,4'DDD, delta-BHC, and gamma-BHC (Lindane)
    - PCBs: Aroclor 1254

29. **Page 7, Section 3.1.1 Risk-based Evaluation (Soil).** Arsenic does not appear to be representative of lead, and it is unclear if other COIs are representative of each constituent class. Please include figures for all COIs with concentrations above hot spot screening criteria.

30. **Page 8, Section 3.1.2 Mobility-based Evaluation.** The highly mobile soil hot spot evaluation needs to be expanded to include the following pathways:

    - Direct discharge to the Willamette River
    - Indirect discharge to the Willamette River via Outfall 22B. This evaluation will be used to ensure the Outfall 22B IRAM is the appropriate remedial action to address this pathway. The reference point for this evaluation is groundwater upgradient of the Outfall 22B system with the potential to migrate along the system.
    - Direct discharge to North Doane Lake
    - Industrial use of the Colluvial-Alluvial Gravel/Basalt groundwater

31. **Page 8, Section 3.1.2 Mobility-based Evaluation.** As noted in Comment #20, sufficient justification is required to support the use of a soil/water partitioning equation and 20x DAF. DEQ's notes that a review of the 2,4-D; gamma-BHC; 2,4,6-trichlorophenol; 1,4-dichlorobenzene and ethylbenzene groundwater plumes also indicates that the former Doane Lake sediments are a likely source of the observed groundwater exceedances in shallow groundwater upgradient of the City Outfall 22B stormwater system and should be evaluated as potential highly mobile soil hot spots if groundwater hot spots associated with the City Outfall 22B stormwater system are identified.

32. **Table A2-A, Section 3.1.2 Mobility-based Evaluation.** Soil mobility for several COIs, such as dinoseb and MCPA, was not evaluated because ACG/CRBG SLVs were not identified. Please identify hot spot threshold values using appropriate surrogates for all contaminants without SLVs, consistent with the site-specific risk assessments.

33. **Page 8, Section 3.1.2 Mobility-based Evaluation.** COIs with "sporadic or isolated detections" were inappropriately excluded from the highly mobile hot spot evaluation. Please identify potential highly mobile soil hot spots consistent with Comment #20.

34. **Page 8, Section 3.2.1 Mobility-based Evaluation.** Former Doane Lake sediments are part of the Rhone-Poulenc LOF. Please screen applicable sediment results as part of the mobility-based evaluation, as appropriate consistent, with Comment #20.

35. **Page 11, Section 3.3.1 Risk-based Evaluation of ACG/CRBG Groundwater**. COIs with "sporadic or isolated detections" above the groundwater criteria were inappropriately excluded from the risk-based hot spot evaluation. All groundwater samples that exceed hot spot levels need to be identified as preliminary hot spots. Based on the text presented in Section 3.3.1 these include the following COIs:

    - PCDDs/PCDFs: all PCDDs/PCDFs
    - Residual Range Organics
    - Herbicides: 2,4,5-TP(Silvex), and 2,4-DB
    - Inorganics: total lead, and total and dissolved vanadium

- OCIs: 4,4'DDD, 4,4'-DDT, aldrin, alpha-BHC, alpha-chlordane, and hexachlorobenzene
- SVOCs: 4,6-Dichloro-o-cresol, and bis(2-ethylhexyl)phthalate
- VOCs: 1,2,3-trichlorbenzne, bromomethane, hexachlorobutadiene, and tetrachloroethene

36. **Page 12, Section 3.3.1 Risk-based Evaluation of ACG/CRBG Groundwater.** OCI data collected prior to 2007 were inappropriately excluded at selected locations in the LADD and NPA. The Preliminary Hot Spot Evaluation must be revised to indentify preliminary hot spots based on all validated data. Additional data may be collected as part of an FS data gap work plan to support excluding the pre-2007 OCI data.

37. **Page 12, Section 3.3.1 Risk-based Evaluation of ACG/CRBG Groundwater.** Naphthalene is inappropriately excluded as an identified potential groundwater hot spot contaminant for the Site.

    Please revise the Preliminary Hot Spot Evaluation to identify potential groundwater hot spots based on all validated data. Additional data may be collected as part of an FS data gap work plan to potentially exclude of naphthalene as a groundwater hot spot at the Site.

38. **Page 16, 3.32.2 NDL GW/PW/SW.** Contaminants with a possible complete groundwater pathway that were detected in North Doane Lake pore water and/or groundwater need to be identified as potential groundwater hot spots. Rhone-Poulenc related contaminants cannot be excluded based on insufficient data in pore water/groundwater, potential additional sources, or infrequent detections in surface water. Additional sampling must be collected as part of the FS to address data gaps and complete the assessment.

39. **Table A2-1. Hot Spot Screening Criteria-Soil and Groundwater.** Please update this table to be consistent with the hot spot threshold levels developed as part of the RAOs.

40. **Figure A2.1-1 Site LOF.** The full extent of former Doane Lake must be included in the LOF figure for reference. Please revise the LOF figure to be consistent with Figures 37 and 38 from Attachment 1 of the RI/SCE Report Addendum.

41. **Figures A3. 1-1 through 1-12.** As requested by DEQ on February 19, 2013, please update these figures to include contouring using broadly accepted routines such as kriging, nearest neighbor, or similar methods. Please include contour intervals for the RBC, hot spot threshold level and 10x the hot spot criteria. Figures should be developed consistent with the guidance DEQ provided in our February 19, 2013 email (see Attachment 4).

42. **Figures A3.3-1 through A3.3-6. 3.3.1 Risk-based Hot Spot Evaluation ACG/CRBG Groundwater.** It appears these figures depict the ACG/CRBG Industrial Water use pathway. Please revise the figure titles to clarify.

43. **Figures A3.3-1 through A3.3-6. 3.3.1 Risk-based Ho Spot Evaluation ACG/CRBG Groundwater.** Hot spot figures for the groundwater discharge to surface water pathway must be presented. Figures must show hot spots associated with groundwater discharge to

North Doane Lake, direct discharge, and indirect discharge via the Outfall 22B system to the Willamette River.

DEQ appreciates the work completed by StarLink to prepare the draft FS work plan. Please submit a revised work plan to DEQ within 90 days, and feel free to give me a call at 203 229-6748 if you have any questions.

Sincerely,

Scott Manzano, Project Manager
DEQ NWR Cleanup Program

cc: Joan Underwood, Quantum Management Group
Ken Angelos, Golder Associates
Jim Benedict, Cable, Huston, Benedict, Haagensen & Lloyd
Keith Johnson, DEQ NWR
Eva DeMaria, EPA

Attachments:
Attachment 1: Consent Order Attachment B Remedial Investigation/Feasibility Study Scope of Work

Attachment 2: EPA Review of Feasibility Study Work Plan

Attachment 3: Initial Screening of Technologies from Technical Memorandum #2 Preliminary Screening of Technologies

Attachment 4: DEQ February 19, 2013 Email

Attachment 1

Consent Order Attachment B Remedial Investigation/Feasibility Study Scope of Work

Procedures: The HASP shall include a description of risks related to RI activities, protective clothing and equipment, training, monitoring procedures, decontamination procedures and emergency response actions.

V. FEASIBILITY STUDY WORK PLAN

Objective: To develop the information required to identify and evaluate remedial action alternatives and select or approve a remedial action to be performed at the facility.

Scope: The Feasibility Study (FS) shall be developed in accordance with the requirements specified in OAR 340-122-085 and 090, DEQ guidance and, as appropriate, Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, OSWER Directive 9355.3-01, 1988. The FS shall develop and evaluate an appropriate range of alternatives. The FS may be developed in parallel with Remedial Investigation (RI) activities or may be developed and submitted separately after completion of RI activities.

Procedures: A work plan shall be submitted which will include, but not be limited to, the following:

A. PRELIMINARY EVALUATION OF REMEDIAL INVESTIGATION DATA

The FS work plan shall include a preliminary evaluation of data collected during the RI. The evaluation should be used to identify preliminary remedial alternatives and identify additional data needs. The preliminary evaluation of the RI data shall include, but not be limited to, the following:

1. A summary of DEQ's determination of the current and reasonably likely future beneficial uses of groundwater and surface water in the locality of the facility.

2. A summary of the current and reasonably likely future land use in the locality of the facility based upon the determinations made by DEQ.

3. A preliminary identification of hot spots that meet the definition in OAR 340-122-115 (31).

4. A preliminary identification of relevant federal, state, and local laws and regulations.

5. Proposed contaminant concentration levels that meet preliminary remedial goals.

6. A preliminary volume estimate for each affected environmental medium.

7. A preliminary estimate of hot spot volumes.

8. Description of any additional investigative work that needs to be conducted to complete the FS.

B. DESCRIPTION OF FS EVALUATION PROCESS

The FS work plan shall include a description of how remedial action technologies will be identified and screened and how remedial action alternatives will be developed, screened, and evaluated in detail. The plan shall include but not be limited to the following:

1. Identify how the areas or volumes of media which require remedial actions will be determined. Describe selection criteria for identification of areas needing remedial action.

2. Describe development of remedial action objectives (RAOs) that meet the standards in OAR 340-122-040. RAOs should specify the contaminants and media of interest, exposure pathways, and preliminary remediation goals that permit a range of treatment, engineering and institutional controls, and removal alternatives to be developed.

3. Describe interim remediation activities, which have been implemented to date or are planned, and the relationship of the interim activities to the preliminary RAOs.

4. Describe how general response actions will be identified. General response actions should describe areas or volumes of media to which containment, treatment or removal actions may be applied that may satisfy the RAOs for the site.

5. Describe how potential remedial action technologies applicable to each general response action will be identified.

6. Describe how the technologies will be identified and eliminated (screened) based on effectiveness, implementablity and cost.

7. Describe how technology process options will be identified and evaluated to select a representative process for each technology type retained for consideration.

8. Describe any treatability study data necessary for the evaluation of remedial action alternatives and how that data will be obtained.

9. Describe how the selected representative technologies and process options will be assembled into a range of media-specific or site-wide preliminary remedial action alternatives representing treatment, engineering or institutional controls or removal combinations as specified in OAR 340-122-085 (2).

10. Describe how the preliminary remedial action alternatives will be developed and eliminated (screened), if necessary, based on effectiveness, implementablity, and cost.

11. Describe how the detailed analysis of remedial action alternatives retained through the screening process will be completed including application of the higher threshold of cost for the treatment of hot spots. Detailed analysis of remedial action alternatives should be completed in compliance with OAR 340-122-085 and 340-122-090.

12. Describe how the remedial action alternatives retained through the screening process and detailed analysis will be compared to one another.

13. Describe how compliance with other applicable or relevant and appropriate laws and regulations will be achieved, including, but not limited to compliance with Total Maximum Daily Loads (TMDLs) under the Clean Water Act relevant to any contaminant migration to the Willamette River.

14. Describe how the residual risk assessment will be performed in accordance with OAR 340-122-084(4).

VI. REPORTS

A. QUARTERLY REPORTS

2 copies of the Quarterly Reports shall be submitted to DEQ by the 10th day of the month following the reporting period. The quarterly reports shall summarize activities performed, data results collected or received and problems encountered or resolved during the past three months, and activities planned for the upcoming three months.

B. REMEDIAL INVESTIGATION REPORT

The Remedial Investigation report shall follow the outline in Table 3-13 (page 3-30 - 3-31) in the CERCLA RI/FS guidance, as applicable, and address the items listed below:

1. Executive Summary.

2. Introduction.

3. Site Background. A discussion and supporting maps of facility operations, site description, site setting, and current and reasonably likely future land and water uses.

4. Study Area Investigation. A discussion of the investigative procedures and results for soil, groundwater, surface water, sediments and air.

Attachment 2

EPA Review of Feasibility Study Work Plan

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
OREGON OPERATIONS OFFICE
805 SW Broadway, Suite 500
Portland, Oregon 97205

August 9, 2013

Mr. Dave Lacey
Oregon Department of Environmental Quality
Northwest Region Office
2020 SW 4th Avenue, Suite 400
Portland, Oregon 97201

RE: EPA Review of Feasibility Study Work Plan, Former Rhone Poulenc Site, Portland, Oregon (July 8, 2013)

Dear Mr. Lacey:

The Environmental Protection Agency (EPA) has completed its review of the subject work plan. We have attached for your consideration and use general and specific review comments compiled by EPA and its contractor CDM Smith.

EPA's review has identified issues with the lack of details provided in many sections of the work plan and with specifics related to content in Section 4.0 Development and Screening of Remedial Action Alternatives. Please note that some comments are based on needs to complete a Feasibility Study for a Superfund site under CERCLA guidances; we offer these comments but the State may have other requirements for this work. Our review also raised a number of concerns with the Appendix A Preliminary Hot Spot evaluation. Finally, EPA is concerned that no indication has been made in this document that the responsible party will be implementing any of the recommendations for date collection in my memo to you dated April 18, 2013, as none of our recommendations were provided in Section 6.0 Data Needs of the Work Plan. With the State's Upland Source Control Summary Report planned for late 2013 and EPA's Portland Harbor Proposed Plan scheduled for release to the public in 2014, we can only assume that our outstanding concerns will remain so as EPA attempts to determine the potential impacts from this site to an in-water remedy for the Willamette River. EPA and CDM Smith are available to meet with you at your convenience to discuss these comments and concerns.

Please feel free to contact me at 503-326-6554 or muza.richard@epa.gov regarding any questions that you might have on EPA's review of the Feasibility Study Work Plan for former the Rhone Poulenc Site.

Sincerely,

Rich Muza

Rich Muza, RPM

Attachment

Review Comments on the Feasibility Study Work Plan and Preliminary Hot Spot Evaluation, Former Rhone-Poulenc Site, Portland, Oregon

Feasibility Study Work Plan: General Comments

1. The Feasibility Study (FS) Work Plan does not provide specific details of how the FS document will be organized. Additional detail in Section 7.0 would be helpful to understand which sections will be supported with details in appendices to illustrate evaluation work.

2. The Work Plan indicates that an offsite Human Health Risk Assessment (HHRA) will be conducted and results from this assessment incorporated into the FS. No indication is given regarding outstanding risk assessment issues, whether a work plan for this effort has been or will be developed, or when and how the HHRA will be completed and used to support the FS and pilot study. It may be difficult to move forward with much of the FS – in particular the detailed evaluation of alternatives – without defined Remedial Goals (RGs), Remedial Action Limits (RALs), and clean-up targets. A work plan and schedule for additional HHRA efforts should be developed, reviewed, and finalized as quickly as possible. As appropriate, the HHRA should refer to methods and approaches used in the Harbor-wide Baseline Risk Assessment completed by the Lower Willamette Group (LWG).

3. The FS Work Plan does not address how treatment technologies will be identified and evaluated considering the different depth intervals. Remedial action depth can have a significant impact on implementability of some remedial technologies. Note that technologies should not always be discounted if treatment depth varies between areas and it proves not to be universally applicable across the site.

4. The FS Work Plan does not address how alternatives will be developed based on matrix when the complex combination of contaminants of concern (COCs) is present. This issue often leads to confusion during FS preparation, and appropriate technologies may be screened out or in because of difficulties associated with treating relatively minor COCs.

Feasibility Study Work Plan: Specific Comments

1. Page 4, Section 2.2 -- Summaries of previously completed interim remedial action measures (IRAMs) and treatability studies should include a brief discussion of their effectiveness and provide a reference to associated IRAM monitoring reports. This will help provide clarity on the effectiveness of these IRAMs and how they will be integrated into development and evaluation of remedial action alternatives and the ultimate site remedy.

2. Page 4, Section 2.2 -- More information should be provided explaining the long succession of work efforts on the Outfall 22B IRAM. A citation to a detailed IRAM report is missing. The IRAM summary should include an explanation of repairs and additional sewer lining work performed over the past 8 years continuing into 2013. Absent this information, it remains unclear about the status and effectiveness of this IRAM and whether the FS needs to include evaluation of additional actions to address the groundwater migration remedial action objective (RAO).

3. Page 5, Section 2.2. Bullet 3 -- Discuss how ozone sparging pilot testing will be conducted and integrated into the FS. The schedule indicates that the pilot study will be completed shortly before the FS is completed; can these results be effectively incorporated into the FS in the time period specified in the FS Work Plan?

4. Page 6, Section 3.1 -- The section states that surface water was not evaluated for human health risk assessment because no surface water is present on the former Rhone Poulenc property. The FS should provide documentation that exposure to surface water (including stormwater with interim ponding) is not expected to be a significant exposure route for human health risk at the site.

5. Page 10, Section 3.3.3 -- EPA has reviewed the RI/SCE and Supplemental Section 8.0 documents and has provided comments on the uncertainty of the data and incomplete characterization of nature and extent of groundwater contamination since 2011. In an April 18th, 2013 letter, EPA provided specific recommendations to address these data gaps concurrent with development of the FS. EPA maintains that there is a lack of data to support the complete extent of COCs in groundwater as currently defined by SLLI in their extent illustrated in Figure A3.3-5 in Appendix A. EPA has presented evidence from the RI/SCE report as well as third party investigation maps and cross-sections showing deeper, coarse-grained sediments immediately above bedrock within a deep groundwater basin underlying the Siltronics site and its property boundary with the NW Natural Property. This area and stratigraphy has been virtually unexplored by SLLI for COCs. EPA provided evidence of upward gradients in this strata that could present an upward discharge of former Rhone Poulenc COCs, if present, to the River. Evaluation of impacts to the Willamette River from the standpoint of groundwater "hot spots" requires consideration of the relationship between upland cleanup activities and the need for source control measures to address groundwater discharge.

6. Page 11, Section 4.1 -- This introduction should clearly explain the process and that identification of potential ARARs in the FS is an initial step to identify whether the potential ARARs actually qualify as ARARs and a comparison for stringency between the Federal and State regulations to identify the controlling ARARs. As such, the identification of ARARs is an iterative process. The final determination of ARARs (i.e., no longer "potential" ARARs) should be made in a decision document, with ODEQ concurrence, as part of the response action selection process.

7. Page 11, Section 4.1.1 -- Paragraph 1 states administrative requirements are not ARARs. However, cleanup actions at the former Rhone Poulenc facility are being addressed under DEQ requirements and guidance. As such and like other cleanup actions being undertaken through DEQ authorities on uplands cleanup sites at Portland Harbor, any required permits will need to be coordinated and attained through the proper permitting agency.

8. Page 12, Section 4.1.1 & 4.1.2 -- The discussion should be revised to differentiate between categories for State and Federal regulations and to clearly state the categories (chemical, action, location-specific) for the list of potential ARARs. In addition, the discussion should clarify that potential location-specific and chemical-specific ARARs could be identified in the initial phase, but the action-specific ARARs cannot be identified until later phases of the FS process.

9. Page 12, Section 4.1.2 – Since any cleanup actions to be performed at the site will occur under authorities of DEQ, the ARARs determination should focus on State ARARs are the primary driver. For example, the Clean Water Act is cited here; however, EPA-approved Water Quality Standards developed by DEQ

under the Toxics Standards Rule (OAR-340-041-0033) should be considered as ARARs over equivalent Water Quality Criteria established by EPA under the Clean Water Act.

10. Page 13, Section 4.2.1 -- "Non-hot spot levels" in bullet 1 is very general description and difficult to evaluate as an RAO; please clarify this statement. Note that this comment also applies to Section 4.2.3.

11. Page 13, Section 4.2, General – The proposed RAOs are too vague to support alternatives analysis and at times are oddly worded and difficult to interpret. Specific comments are listed by media below:

    Soil, Section 4.2.1 -- A RAO based on hot spot analysis is driven by DEQ requirements. However, this requirement is not explained in the text and should be specific per OAR 340-122-0085 for the FS process. Without this background, it would appear that soil remediation is covered adequately with the subsequent RAO to reduce health risks. Further, it is recommended that language such as "feasibility of excavation and offsite disposal at an authorized disposal facility, to a point where the concentration or condition making the hazardous substance a hot spot would no longer occur at the facility" should be incorporated into the RAO. The RAO for health risk is vague. It is recommended that it be rewritten to reflect COCs in the risk assessment and to set general goals for risk reduction; for example, "reduce exposure to dioxin/furans in soil to achieve risk-based or background soil concentrations as developed from information in the risk assessments and RI." The final RAO for contaminant migration is unclear, but appears to indicate that sediment remediation near possible discharge points will not be considered if such remediation occurs after the soil remedy is in place. The RAO should be focused on reducing or eliminating release of contaminants to the river and should include both COCs and the concepts for benthic toxicity as developed in the harbor-wide RI and ecological risk assessment. The RAO should not be accepted as written.

    Groundwater, Section 4.2.2 -- A RAO based on hot spot analysis is driven by DEQ requirements. However, this requirement is not explained in the text. Without this background, it would appear that soil remediation is covered adequately with the subsequent RAO to reduce health risks. Further, it is recommended that language such as "feasibility of removal and/or treatment to a point where the concentration or condition making the hazardous substance a hot spot would no longer occur at the facility" be incorporated into the RAO. The RAO for health risk is vague. It is recommended that it be rewritten to reflect COCs in the risk assessment and should set general goals for risk reduction; for example, "reduce exposure to dioxin/furans in soil to achieve risk-based or background soil concentrations as developed from information in the risk assessments and RI." The RAO for protection of ecological protection is also vague. Again, specific COCs to be considered in the FS should be identified, along with receptors to be protected. Given the current RAO statement, the work plan should identify what threatened or endangered species exist at the Rhone-Poulenc site or off shore of this property. Finally, the migration RAO is oddly stated and unacceptable as presented. It appears to indicate that sediment remediation near possible discharge points will not be considered if such remediation occurs after the soil remedy is in place. The RAO should be focused on reducing or eliminating release of COCs to the river and should include both COCs and the concepts for benthic toxicity as developed in the harbor-wide RI and ecological risk assessment.

    NAPL, Section 4.2.3 -- The hot spot analysis needs explanation as suggested for soil and groundwater above. Further, the RAO is written as if reducing concentrations, volumes, and mobility were mutually exclusive – one would have to do one or another, not in combination. More importantly, the RAO again fails to mention COCs and does not provide useful targets for cleanup. Finally, it is recommended that language such as "feasibility of removal and/or treatment of NAPL to a point where it no longer represents a significant source of hazardous substances representing a hot spot" be incorporated into the

RAO. The final RAO for migration is unclear but appears to indicate that sediment remediation near possible discharge points will not be considered if such remediation occurs after the soil remedy is in place. The RAO should be focused on reducing or eliminating release of COCs to the river and should include both COCs and the concepts for benthic toxicity as developed in the harbor-wide RI and ecological risk assessment. The RAO should not be accepted as written.

12. Page 14, Section 4.4 -- The preliminary bullet list provided indicates that very few technologies will be screened, although many potentially relevant technologies should be included in the initial screening. Please indicate that the specific technologies in parentheses are only an example. It is recommended that a more exhaustive list be provided that includes innovative technologies and/or "green technologies" employing sustainable techniques.

13. Page 15, Section 4.5 -- In the second to last sentence, "groundwater response actions" is written. This is likely a typo that should be revised to "general response actions." If not, please explain what is meant by "groundwater response actions" in this context.

14. Page 17, Section 5.0 -- The third bullet under "Cost Reasonableness" discusses hot spots in water. This is a similar statement to the third bullet under "Treatment of Hot Spots." Please move first bullet under "Cost Reasonableness" to "Treatment of Hot Spots."

15. Page 17, Section 5.0 -- The second to last bullet regarding costs for treatment of hot spots is not clear; please re-word this bullet.

16. Page 17, Section 5.1 -- The comparative analysis of alternatives does not provide a presumptive remedial action timeframe. Timeframe, or the duration of implementation, is an important factor that affects risk reduction/protectiveness, acceptability, and cost in the comparative analysis.

17. Page 19, Section 6.0 -- SLLI should include in their list of data needs for additional delineation and movement, both horizontally and vertically, of COCs in deep groundwater within the coarse-grained basal layer of the groundwater basin identified in the 2010 RI/SCE Report. This focus area underlies the Siltronics property and the boundary of the Siltronics and NW Natural properties. Please see EPA's April 18, 2013 letter for specific recommendations on this and other data needs to fully define COCs transport and fate in groundwater.

18. Page 20, Section 7.0 -- A more descriptive outline for the FS report should be provided, detailing at least one sublevel of categories to be addressed and anticipated appendices.

Feasibility Study Work Plan: Tables & Figures

1. Figure 7-1 -- SLLI should replace the schedule with one that shows dependent milestones for the series of events. As shown currently, one cannot determine the interdependence of the activities including the off-site HHRA, hot spot evaluation, or the pilot study. Additionally, SLLI should include "Preliminary" in the label for the Hot Spot Evaluation and provide a specific name for the Pilot Test planned from June to November 2013, such as "Ozone Sparging Pilot Test", to clarify what type of pilot test is being scheduled.

2. Table 4-1 -- For this initial phase, the screening of potential technologies should be grouped in and ranked in three categories: 1) General Response Actions, 2) Remedial Technologies, and 3) Process Options. This screening does not differentiate between technologies (i.e., treatment) and process options (i.e., in-situ anaerobic bioremediation). Additionally, a description of each process option should be provided in the table.

3. Table 5-1 -- As per comment above, the table should be revised to acknowledge the two threshold criteria that are not ranked, weighted, or scored. For the other five criteria, the table should identify a relative ranking or scoring in a qualitative manner, using symbols or adjectives (such as high, medium, medium-low, and low) which are more flexible and best conform to the objective of the FS to provide information to support decision making by DEQ. Because the concept of "weighting" implies judgment or decision making which is not part of the FS process, use of factors for weighting or quantitative balancing should remain the role of DEQ in their decision-making process.

Appendix A - Preliminary Hot Spot Evaluation: General Comments

1. SLLI should provide more information on data selection for the water hot spot evaluation; as it is currently described, it is too general to understand what specific data are being used for the hot spot evaluation. EPA is aware of the over 30 years of data collected and presented in the 2010 Draft RI/SCE report; we are also aware that there are very limited periods within that temporal data where comprehensive sampling with consistent and acceptable laboratory methods were used. Given these circumstances, it is imperative that the dataset selection be clearly presented with maps and tables showing spatial locations of the data used, the specific dates, and any filtering of data performed.

2. The preliminary hot spot analysis appears to be based on a simplified method that relies on a count of samples or number of analytical results that are over a health-based receptor screening level criteria. An issue with this simplified analysis is that there are no statistics performed to account for the number of samples collected. This method can easily miss the significance, or conversely insignificance, of a single detection when it is not based on the number of samples in the data set. For example, a constituent with single detection greater than screening criteria is excluded for hot spot consideration compared to a constituent with 5 detected values, but the number of samples used as a basis is very different. The single detection excluded for hot spot evaluation was based on three samples/analyses of a particular constituent and the other area with five detections was based on 52 samples/analyses of a particular constituent. SLLI should include a more robust, statistical method that integrates these results with the number of samples, possibly using some weighting factor based on the sample number. In the absence of this additional analysis, there is uncertainty if instances exist in the preliminary hot spot evaluation where constituents, or areas with limited sampling, have incorrectly been excluded for hot spot evaluation and FS remedy evaluation. Furthermore, the approach presented may not be consistent with DEQ requirements. Isolated occurrences of soil hot spot high concentration thresholds are still hot spots. Evaluation of alternatives will determine the viability in treating isolated areas as hot spots. Note that no requirement exists to treat or remove hot spots; rather, by the DEQ method, an evaluation proceeds with a higher cost threshold applied to the evaluation of such.

3. Similar to the above comment, the Hot Spot Evaluation does not discuss variability in soil concentrations below 15 feet below ground surface (bgs) or groundwater concentrations in the vertical aspect. As noted in FS Work Plan General Comment #3, evaluating remedial technologies is heavily dependent upon

vertical distribution of COCs. Please discuss why soil delineation was not performed below 15 feet bgs and why vertical delineation of groundwater was not considered.

4. It does not appear that any additional evaluation was performed for NAPL as a hot spot. Please provide more discussion of the horizontal and vertical extent of the NAPL hot spot area.

Appendix A - Preliminary Hot Spot Evaluation: Specific Comments

1. Page 4, Section 2.3 -- SLLI should clearly describe how they incorporated temporal and spatial randomness inherent in the RI/SCE data set (see Appendix A General Comment #1) in combination with groundwater flow and transport into the hot spot evaluation.

2. Page 4, Section 2.3 -- SLLI should present collection dates for River transition zone water samples used in the hot spot evaluation for the area of Outfall 22B/22C. The timeframe for hot spot conditions is significant. If data are older than three years, some additional confirmation sampling is warranted, since natural depositional and erosion processes could change conditions assumed for the Hot Spot Evaluation. Further, the analysis does not appear to consider benthic toxicity, as identified in the site-wide ecological risk assessment. Toxicity to benthic invertebrates is empirical, based on the results of toxicity testing, and it cannot be easily evaluated based on individual chemicals in transition zone water. Protecting benthic invertebrates needs to be considered in the analysis and may require a qualitative process for identifying "hot spots." The evaluation of alternatives that may have the greatest impact on reducing or eliminating discharge of contaminated groundwater may also be necessary. Finally, note that transition zone water is likely to reasonably reflect exposure conditions for benthic invertebrates and might be more appropriately characterized as representative rather than conservative.

3. Pages 11-12, Section 3.3.1 -- SLLI points out that "because of the temporal nature of the groundwater data set, Table A3-3 includes a column identifying the most (recent) year with a detection above screening values." SLLI should explain with more detail the significance of these dates with respect to the hot spot evaluation for the Exposure Units (EUs) and the transport of COCs from the EUs (see Appendix A Specific Comment #1).

4. Pages 12, Section 3.3.1 -- Information provided does not support efforts to identify how the EUs were characterized or how many samples have been collected in each EU since 2007 when analytical methodologies were improved. SLLI should present this information so that reviewers can understand the extent of characterization at each of the EUs post 2006. Absent this information, there is uncertainty in the preliminary hot spot evaluation to identify whether or not EUs with limited sampling after 2006 have incorrectly been excluded for hot spot evaluation and FS remedy evaluation.

5. Pages 12-14, Section 3.3.1 -- The groundwater data for all of the COCs evaluated appear to be very limited in the herbicide area (HA), insecticide area (IA), and lake area drainage ditch (LADD). The number of samples in these areas are around a dozen and, in many instances, COCs are based on a single sample. This appears to be insufficient data to perform a hot spot evaluation and is in stark contrast to the more extensive samples collected at offsite neighboring properties (see Table A3-A for an example). SLLI should collect additional data in the EU areas to verify their conclusions and support a more rigorous characterization for nature and extent evaluations.

6. Pages 14-15, Section 3.3.2.1 -- SLLI should provide a map showing where these sample results were collected and the dates they were collected. As discussed in Appendix A Specific Comment #2, if samples are older than three years, it would seem to require some additional confirmation sampling since natural depositional and erosion processes could easily change the conditions this preliminary hot spot evaluation is basing its conclusions on.

7. Page 18, Section 4.0 -- SLLI should present more information describing what will be done for further evaluation of hot spots for soil, NAPL, and groundwater as indicated in the title "Hot Spot Areas for Further Evaluation." EPA recognizes data gaps for EUs where NAPL is delineated on Figure A3.2-1; groundwater sampling, for example, appears deficient for hot spot analysis in the HA, IA, and LADD areas. Accordingly, it is EPA's expectation that SLLI will describe how such data gaps will be addressed and new data used in further hot spot evaluation. This information should be referenced under Section 6.0 (Data Needs) of the FS Work Plan.

Appendix A - Preliminary Hot Spot Evaluation: Tables & Figures

1. Figures A3.3-5 & A3.3-6 -- These figures show the approximate extent of the groundwater hot spot of specific COCs (1,4-Dichlorobenzene and Vinyl Chloride). SLLI should note that extents are limited to the dissolved phase; they do not reflect the extent of these COCs in NAPL, which may likely extend into the HA, as evidenced by the Composite Hot Spots and NAPL extent delineated in Figures A3.1-13 and A3.2-1.

2. Tables A3-1 thru A3-4 -- SLLI should include a column showing the total number of samples for each COC sampled within each exposure unit to show percentage of detections that exceed screening criteria.

Attachment 3

Initial Screening of Technologies from Technical Memorandum #2 Preliminary Screening of Technologies

RESPONSE ACTION	TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING ACTION
No Action	None	Not Applicable	No action.	Required for consideration by NCP.
Institutional Controls	Access Restrictions	Deed Restrictions	Covenants for property use in the area of influence would induce restrictions on use.	Potentially applicable.
		Fencing	Fencing of the site to restrict access.	Potentially applicable.
	Monitoring	Groundwater Monitoring	Ongoing monitoring of groundwater wells.	Potentially applicable.
		Surface Water Monitoring	Ongoing monitoring of surface water.	Not applicable to soils. Contaminates will reach groundwater or stormwater first.
		Storm-Water Monitoring	Ongoing monitoring of stormwater	Potentially applicable.
Containment	Capping	Concrete Cap	Installation of a concrete slab over areas of contamination.	Potentially applicable.
		Asphalt Cap	Spray application of a layer of asphalt over areas of contamination.	Potentially applicable.
		Multimedia Cap	Clay and synthetic membrane covered by soil over areas of contamination.	Potentially applicable.
		Clay/Soil Cap	Compacted clay covered with soil over areas of contamination.	Potentially applicable.
		Geomembrane/Soil Cap	Layer of geomembrane under soil covering areas of contamination.	Potentially applicable.
		Sand/Gravel Cap	Placement of a layer of sand and gravel over soils.	Not applicable to soils.
Removal	Excavation	Excavation	Removal of contaminated soils with standard earth-moving equipment.	Potentially applicable.
	Thermal	Thermal Desorption	Removal and destruction of organic contaminants from waste by low temperature thermal treatment.	Potentially applicable.
		On-site Incineration	Destruction of organics on-site by high temperature oxidation.	Potentially applicable.
		Off-site Incineration	Destruction of organics off-site by high temperature oxidation.	Potentially applicable.
	Biological	Slurry-Phase Bioreactors	Biological treatment of soils by using slurry phase reactors with nutrient/bacteria addition.	Potentially applicable.
		Landfarming	Spreading the wastes over the ground with the addition of nutrients/bacteria to enhance biodegradation.	Potentially applicable.
		Composting	Contaminated soils are placed in compost piles with nutrients/bacteria added to enhance biodegradation.	Potentially applicable.
Treatment	Physical/Chemical	Solidification/Stabilization	Mixing of contaminated materials with agents designed to reduce contaminant mobility.	Potentially applicable.
		Dewatering	Removal of significant amounts of water from contaminated soils.	Potentially applicable.
		Soil Washing	Mixing of contaminated soils with water or solvent to mobilize contaminant and achieve volume reduction.	Potentially applicable.
Disposal	On-site Disposal	Vaults	Disposal in reinforced concrete vaults.	Potentially applicable.
		Lined Cell	Disposal of contaminated soils in on-site landfill cell.	Potentially applicable.
		Placement within Cap	Consolidation of waste within cap.	Potentially applicable.
	Off-site Disposal	Subtitle C Landfill	Disposal of hazardous waste in EPA approved hazardous waste landfill.	Potentially applicable.
		Subtitle D Landfill	Disposal of contaminated soils in Subtitle D landfill.	Potentially applicable.
In-situ Treatment	Biological	Bioventing	The addition of air to soils in the vadose zone to promote biodegredation.	Potentially applicable.
		Enhanced Biodegradation	Addition of nutrients/bacteria to promote in situ biodegradation of contaminants.	Potentially applicable.
	Physical/Chemical	Solidification/Stabilization	In-situ mixing of contaminated materials with agents designed to reduce mobility.	Potentially applicable.
		Vapor Extraction	Vapor extraction of volatile organic compounds from vadose zone of soils.	Potentially applicable.

Shading indicates technologies eliminated from further consideration

Project# 92C0804A **Woodward-Clyde Consultants**	RHÔNE-POULENC AG COMPANY Portland, Oregon	Initial Screening of Technologies for Soils	Figure 4-1

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RESPONSE ACTION	TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING ACTION
No Action	None	Not Applicable	No action.	Required for consideration by NCP.
Institutional Controls	Access Restrictions	Deed Restrictions	Covenants for property use in the area of influence would induce restrictions on use.	Potentially applicable.
		Fencing	Fencing of the site to restrict access.	Potentially applicable.
	Monitoring	Groundwater Monitoring	Ongoing monitoring of groundwater wells.	Potentially applicable.
		Surface Water Monitoring	Ongoing monitoring of surface water.	Potentially applicable.
		Storm-Water Monitoring	Ongoing monitoring of stormwater	Not applicable. Contaminants will reach surface water first.
Containment	Capping	Conventional Caps	Caps such as geomembrane, concrete, etc.	Not applicable to sediments as they are saturated with water.
		Sand/Gravel Cap	Placement of a layer of sand and gravel over sediments.	Potentially applicable.
Removal	Excavation	Excavation	Removal of contaminated sediments with standard earth-moving equipment.	Potentially applicable.
	Thermal	Thermal Desorption	Removal and destruction of organic contaminants from waste by low temperature thermal treatment.	Potentially applicable.
		On-site Incineration	Destruction of organics on-site by high temperature oxidation.	Potentially applicable.
		Off-site Incineration	Destruction of organics off-site by high temperature oxidation.	Potentially applicable.
	Biological	Slurry-Phase Bioreactors	Biological treatment of sediments by using slurry phase reactors with nutrient/bacteria addition.	Potentially applicable.
		Landfarming	Spreading the wastes over the ground with the addition of nutrients/bacteria to enhance biodegradation.	Potentially applicable.
		Composting	Contaminated sediments are placed in compost piles with nutrients/bacteria added to enhance biodegradation.	Potentially applicable.
Treatment	Physical/Chemical	Solidification/Stabilization	Mixing of contaminated materials with agents designed to reduce contaminant mobility.	Potentially applicable.
		Dewatering	Removal of significant amounts of water from contaminated sediments.	Potentially applicable.
		Soil Washing	Mixing of contaminated sediments with water or solvent to mobilize contaminant and achieve volume reduction.	Potentially applicable.
Disposal	On-site Disposal	Vaults	Disposal in reinforced concrete vaults.	Potentially applicable.
		Lined Cell	Disposal of contaminated sediments in on-site landfill cell.	Potentially applicable.
		Placement within Cap	Consolidation of waste within cap.	Potentially applicable.
	Off-site Disposal	Subtitle C Landfill	Disposal of hazardous waste in EPA approved hazardous waste landfill.	Potentially applicable.
		Subtitle D Landfill	Disposal of contaminated sediments in Subtitle D landfill.	Potentially applicable.
In-situ Treatment	Biological	Bioventing	The addition of air to sediments in the vadose zone to promote biodegredation.	Not applicable to sediments.
		Enhanced Biodegradation	Addition of nutrients/bacteria to promote in situ biodegradation of contaminants.	Potentially applicable.
	Physical/Chemical	Solidification/Stabilization	In-situ mixing of contaminated materials with agents designed to reduce mobility.	Not applicable to sediments.
		Vapor Extraction	Vapor extraction of volatile organic compounds from vadose zone of sediments.	Not applicable to sediments.

Shading indicates technologies eliminated from further consideration

Project# 92C0804A **Woodward-Clyde Consultants**	RHÔNE-POULENC AG COMPANY Portland, Oregon	Initial Screening of Technologies for Sediments	Figure 4-2

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RESPONSE ACTION	TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING ACTION
No Action	None	Not Applicable	No action.	Required for consideration by NCP.
Institutional Controls	Access Restrictions	Deed Restrictions	Covenants for property use in the area of influence would induce restrictions on use.	Potentially applicable.
		Fencing	Fencing of the site to restrict access.	Not applicable to limiting groundwater exposure.
	Monitoring	Groundwater Monitoring	Ongoing monitoring of wells.	Potentially applicable.
		Surface Water Monitoring	Ongoing monitoring of surface water.	Not considered applicable to monitoring of affected groundwater.
	Alternate Water Supply	New Wells	New wells serve residents in the area of influence.	Not applicable. No drinking water wells between source and river.
		City Water	Extension of municipal well system to serve residents in the area of influence.	Not applicable. No drinking water wells between source and river.
Containment	Vertical Barriers	Slurry Wall	Trench around all or portion of areas of contamination is filled with a soil (or cement) bentonite slurry.	Potentially applicable.
		Sheet Piling	Sheets of steel are driven into the soils surrounding all or a portion of the areas of contamination.	Potentially applicable.
		Grout Curtains	Pressure injection of grout posts in a pattern around area of contamination.	Potentially applicable.
	Hydraulic Barriers	Hydraulic Barriers	Control of groundwater flow by the use of groundwater extraction and/or injection wells.	Potentially applicable.
		Hydraulic control of North Doane Lake	Raising the level of North Doane Lake to achieve hydraulic isolation.	Not applicable to groundwater.
	Horizontal Barriers	Grout Injection	Pressure injection of grout through closely spaced drill holes below areas of contamination.	Not applicable. Not considered feasible for this site.
Collection	Subsurface Drains	Interceptor Trenches	Perforated pipe in trenches backfilled with a porous media to collect contaminated groundwater.	Potentially applicable.
	Extraction	Recovery Wells	Series of wells to collect contaminated groundwater.	Potentially applicable.
Treatment	Biological	Bioreactors	Ex-situ degradation of organic compounds by microbes in aboveground bioreactors.	Potentially applicable.
	Physical/Chemical	Free-Product Recovery	The use of oil/water separators or similar equipment to separate oil from groundwater.	Potentially applicable.
		Air Stripping	Using high volumes of air mixed with groundwater to promote transfer of volatile and semivolatile contaminants to air.	Potentially applicable.
		Carbon Adsorption	Adsorption of contaminants onto activated carbon by passing water through carbon column.	Potentially applicable.
		Ion Exchange	Contaminated water is passed through a resin bed where ions are exchanged between resin and water.	Potentially applicable.
		Steam Stripping	The use of steam to increase temperatures and enhance air stripping treatment. More effective in removing semi-volatiles than air stripping.	Not applicable. Impracticable to steam strip contaminants without on-site source of steam.
		Evaporation	Use heat to evaporate groundwater and achieve volume reduction.	Not applicable. Impracticable to evaporate the quantities of groundwater required to achieve cleanup at the site if on-site heat source is not available.
		UV/Oxidation	The use of ultraviolet light and oxidants to achieve oxidation of contaminants in groundwater.	Potentially applicable.
	Thermal	Incineration	Destruction of organics by high temperature oxidation.	This technology not applicable without significant organic concentrations.
Discharge	On-site Discharge	Infiltration Trenches	Trenches into which treated groundwater is pumped to allow infiltration by gravity.	Potentially applicable.
		Injection Wells	Injection wells inject uncontaminated or treated groundwater back into aquifer, possibly to increase flow through affected soils.	Potentially applicable.
		Doane Lake	Discharge treated groundwaters to Doane lake remnants.	Potentially applicable.
		River	Discharge treated groundwater into Willamette River.	Potentially applicable.
	Off-site Discharge	POTW	Discharge of groundwater to nearest POTW via sanitary sewer.	Potentially applicable.
		RCRA Facility	Extracted groundwater discharged to licensed RCRA facility for treatment and/or disposal.	Potentially applicable.
In-situ Treatment	Biological	Enhanced Biodegredation	System of injection and extraction wells introduce nutrients/bacteria to order to enhance subsurface biodegradation.	Potentially applicable.
		Aeration	Provide aeration to groundwaters in order to volatilize organic compounds, and promote biodegradation.	Not applicable to groundwater.
	Physical/Chemical	Air Sparging	Using wells and blowers to inject air into subsurface to remove contaminants by volatilization.	Potentially applicable.
		Solvent/Surfactant Addition	Addition of solvents/surfactants into subsurface to increase mobility of contaminants for subsequent collection.	Potentially applicable.

Shading indicates technologies eliminated from further consideration.

Project# 92C0804A **Woodward-Clyde Consultants**	RHÔNE-POULENC AG COMPANY Portland, Oregon	Initial Screening of Technologies for Ground Water	Figure 4-3

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RESPONSE ACTION	TECHNOLOGY	PROCESS OPTIONS	DESCRIPTION	SCREENING ACTION
No Action	None	Not Applicable	No action.	Required for consideration by NCP.
Institutional Controls	Access Restrictions	Deed Restrictions	Covenants for property use in the area of influence would induce restrictions on use.	Potentially applicable.
		Fencing	Fencing of the site to restrict access.	Potentially applicable.
	Monitoring	Groundwater Monitoring	Ongoing monitoring of wells.	Potentially applicable.
		Surface Water Monitoring	Ongoing monitoring of surface water.	Potentially applicable.
	Alternate Water Supply	New Wells	New wells serve residents in the area of influence.	Not applicable. No drinking water wells between source and river.
		City Water	Extension of municipal well system to serve residents in the area of influence.	Not applicable. No drinking water wells between source and river.
Containment	Vertical Barriers	Slurry Wall	Trench around all or portion of areas of contamination is filled with a soil (or cement) bentonite slurry.	Not applicable to the containment of surface water.
		Sheet Piling	Sheets of steel are driven into the soils surrounding all or a portion of the areas of contamination.	Not applicable to the containment of surface water.
		Grout Curtains	Pressure injection of grout posts in a pattern around area of contamination.	Not applicable to the containment of surface water.
	Hydraulic Barriers	Hydraulic Barriers	Control of groundwater flow by the use of groundwater extraction and/or injection wells.	Not applicable to surface water.
		Hydraulic control of North Doane Lake	Raising the level of North Doane Lake to achieve hydraulic isolation.	Potentially applicable.
	Horizontal Barriers	Grout Injection	Pressure injection of grout through closely spaced drill holes below areas of contamination.	Not applicable to the containment of surface water.
Collection	Subsurface Drains	Interceptor Trenches	Collection of groundwater in trenches that are either open, or filled with a permeable material.	Not applicable to surface water.
	Extraction	Recovery Wells	Use of recovery wells to collect groundwater.	Not applicable to surface water.
Treatment	Biological	Bioreactors	Ex-situ degradation of organic compounds by microbes in aboveground bioreactors.	Potentially applicable to surface water.
	Physical/Chemical	Free-Product Recovery	The use of oil/water separators or similar equipment to separate oil from groundwater.	Not applicable. No free-product present on site surface waters.
		Air Stripping	Using high volumes of air mixed with surface water to promote transfer of volatile and semivolatile contaminants to air.	Not applicable to surface water.
		Carbon Adsorption	Adsorption of contaminants onto activated carbon by passing water through carbon column.	Potentially applicable.
		Ion Exchange	Contaminated water is passed through a resin bed where ions are exchanged between resin and water.	Potentially applicable.
		Steam Stripping	The use of steam to increase temperatures and enhance air stripping treatment. More effective in removing semi-volatiles than air stripping.	Not applicable. Impracticable to steam strip contaminants without on-site source of steam.
		Evaporation	Use heat to evaporate surface water and achieve volume reduction.	Not applicable. Impracticable to evaporate contaminates without on-site source of steam.
		UV/Oxidation	The use of ultraviolet light and oxidants to achieve oxidation of contaminants in surface water.	Not applicable to surface waters.
	Thermal	Incineration	Destruction of organics by high temperature oxidation.	This technology not applicable without significant organic concentrations.
Discharge	On-site Discharge	Infiltration Trenches	Trenches into which treated surface water is pumped to allow infiltration by gravity.	Not applicable. Discharge of water would be to surface water or sanitary sewer.
		Injection Wells	Wells in which water is injected directly into the groundwater table.	Not applicable.
		Doane Lake	Discharge treated surface waters back into lake remnants.	Potentially applicable.
		River	Discharge treated surface water into Willamette River.	Potentially applicable.
	Off-site Discharge	POTW	Discharge of surface water to nearest POTW via sanitary sewer.	Potentially applicable.
		RCRA Facility	Collected surface water discharged to licensed RCRA facility for treatment and/or disposal.	Potentially applicable.
In-situ Treatment	Biological	Enhanced Biodegredation	Addition of nutrients/bacteria to enhance biodegradation of organics in surface waters.	Not applicable to surface water treatment.
	Physical/Chemical	Aeration	Provide aeration to surface waters in order to volatilize organic compounds, and promote biodegradation.	Potentially applicable.
		Air Sparging	Using wells and blowers to inject air into subsurface to remove contaminants by volitalization.	Not applicable to surface waters.
		Solvent/Surfactant Addition	Addition of solvents/surfactants into subsurface to increase mobility of contaminants for subsequent collection.	Not applicable to surface waters.

Shading indicates technologies eliminated from further consideration.

Project# 92C0804A	RHÔNE-POULENC AG COMPANY	Initial Screening of Technologies for Surface Water	Figure 4-4
Woodward-Clyde Consultants	Portland, Oregon		

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RESPONSE ACTION	PROCESS OPTION	REMEDIAL TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	COST
No Action	None	Not Applicable	No action would not be effective at reducing the toxicity, mobility, volume, or potential exposure to contaminants.	No action is readily implementable.	As no action is taken, there is no cost.
Institutional Controls	Access Restrictions	Deed Restrictions	Effective at minimizing exposure. May be useful alone, or in combination with other, more active, remedial actions.	Deed restrictions are readily implementable.	Cost is considered minimal.
		Fencing	Limited effectiveness in minimizing site access. A fence cannot prevent entry into a restricted area.	Additional fencing or upgrading of existing fencing would be readily implementable.	Fencing is considered to have a minimal cost.
	Monitoring	Groundwater Monitoring	Effective at monitoring migration of soil contamination.	Groundwater monitoring is currently conducted and is considered readily implementable.	Cost of performing groundwater monitoring is considered low.
		Storm-Water Monitoring	Effective in monitoring migration of contaminants from surface soils.	Storm-water monitoring is considered readily implementable.	Cost of storm-water monitoring is considered low.
Containment	Capping	Concrete Cap	Effective in minimizing exposure to affected surface soils. Moderately effective at preventing infiltration of surface water.	Readily implementable, though less so than for an asphalt cap.	Cost for installation of a concrete cap over affected soils is considered low.
		Asphalt Cap	Effective in minimizing exposure to affected surface soils. Moderately effective at preventing infiltration of surface water.	The placement of an asphalt cap over effected soils is considered readily implementable.	Cost for installation of an asphalt cap over affected soils is considered low.
		Multimedia Cap	Least susceptible to weathering and cracking. Prevents direct contact with soils. Highly effective in minimizing infiltration.	Moderately implementable. Would require importing clay, and possible demolition of existing asphalt cap.	Installation of a multimedia cap is considered moderate in cost.
		Clay/Soil Cap	Somewhat susceptible to cracking. Clay prevents contact with soil and is effective at preventing infiltration.	Moderately implementable. Would require importing clay, and possible demolition of existing asphalt cap.	Installation of a clay/soil cap is considered moderate in cost.
		Geomembrane/Soil Cap	More effective than clay/soil in preventing infiltration, but shorter in lifespan. Effective barrier to direct contact with soil.	Moderately implementable. May require demolition existing asphalt cap.	Cost for installation of a geomembrane/soil cap is considered moderate.
Removal Treatment Disposal	Excavation	Excavation	Effective for removing contaminated materials.	Considered readily implementable. Excavation equipment is readily available.	Cost for excavation is relatively low.
	Physical/Chemical Treatment	Thermal Desorption	Potentially effective for limited volumes of soil. Dewatering required. Must meet discharge standards.	Method is commercially available and implementable.	Cost is considered high, but may be less than other thermal technologies.
		On-Site Incineration	Very effective. Not considered effective for limited volumes of soil at the RPAC site.	Readily available and implementable, but permitting may be difficult.	Operation, maintenence, and permitting costs considered high.
		Off-Site Incineration	Very effective. Few permitted facilities are available. Inorganic compounds can present potential treatment problems.	Moderately implementable. Permitted incinerators are in place, but are far from the site.	Cost is high due to incineration fees and transport costs.
		Slurry Phase Bioreactors	Expected to be effective. Bench or pilot studies must be conducted first.	Moderately implementable. A significant amount of mechanical equipment is necessary.	Cost is considered moderate.
		Composting	Considered effective for pesticides. Bench or pilot studies necessary. Landfarming considered more effective.	Readily implementable, though less so than landfarming	Cost is considered low.
		Landfarming	Potentially effective for organic compounds. Bench or pilot studies must be conducted.	Readily implementable. The site has ample space to implement this technology.	Cost is considered low.
		Solidification/Stabilization	Moderately effective for treating organics. Long-term stability of stabilizing mixtures has not been proven.	Moderately implementable. Requires excavation, treatment, and replacement on-site. Mechanically and labor intensive.	Cost is considered moderate compared to other technologies.
		Soil Washing	Most applicable when contaminates are in fine soil. It is difficult to predict the removal abilities of a full scale system.	Moderately difficult to implement due to mechanical complexity. Requires treatability testing prior to implementation.	Moderately high cost compared to other technologies. Operating cost is considered high.
		Dewatering	Effective dewatering can be accomplished to whatever level necessary. Several different mechanisms are available.	Readily implementable. Can become impracticable if large volumes of soil or sediment are required to be removed.	Cost is generally considered low.
	On-Site Disposal	Vaults	Prevents water infiltration through wastes. Provides a barrier to direct contact with wastes.	Construction of vaults is implementable. Large volumes of affected soil or sediment can make method impractical.	Cost is considered high compared to other available technologies.
		Lined Cell	Effective for containment of sediment or soil. Monitoring and leachate collection would ensure containment of sediments.	Readily implementable. The technology is well established. Use of existing landfills is more implementable.	Cost is considered high when compared to other available technologies.
		Placement Within Cap	Potentially effective if used in conjunction with a capping technology. Minimizes importing of clean fill to construct a cap.	Readily implementable. Requires standard earth moving technologies.	Cost is considered low to moderate depending on the depth of excavation required.
	Off-Site Disposal	Subtitle C Landfill	Effective method of hazardous waste disposal. Hazardous waste landfills are commonly used for disposal.	Moderately implementable. Some contaminants are banned from landfills. Prior treatment may be necessary.	Cost considered high for large volumes of materials. May be cost effective for smaller volumes.
		Subtitle D Landfill	Appropriate only for solid waste. Not acceptable or effective for disposal of hazardous constituents in soil or sediment.	Not readily implementable. Agencies will not likely approve the use of solid waste landfills for disposal of RPAC wastes.	The cost is considered low.
In-Situ Treatment	Biological	Enhanced Biodegradation	Considered potentially effective. Would require a bench and pilot study to determine actual effectiveness.	Readily implementable. Recirculation and nutrient addition systems are relatively simple. Would require a bench and pilot study.	Cost is relatively low compared to other technologies. No excavation or disposal costs.
		Bioventing	Possibly effective. Bench testing and soil gas permeability must be determined to evaluate effectiveness.	Readily implementable. Nutrient addition, if necessary can be problematic, making implementation more difficult.	Cost is considered low compared to other technologies.
	Physical/Chemical	Vapor Extraction	Not considered effective because the majority of chemicals of concern are not volatile.	Readily implementable.	Low to moderate cost depending on the nature of off-gas treatment required.
		Solidification/Stabilization	Moderately effective. Long-term effectiveness of stabilized organics has not been verified.	Considered difficult to implement at this site, due to large volume of affected media.	Cost is considered moderate to high for this site.

Shading indicates technologies eliminated from further consideration.

Project# 92C0804A **Woodward-Clyde Consultants**	RHÔNE-POULENC AG COMPANY Portland, Oregon	Second Screening of Technologies for Soils	Figure 4-5

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RESPONSE ACTION	PROCESS OPTION	REMEDIAL TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	COST
No Action	None	Not Applicable	No action would not be effective at reducing the toxicity, mobility, volume, or exposure to contaminants.	No action is readily implementable.	As no action is taken, there is no cost.
Institutional Controls	Access Restrictions	Deed Restrictions	Effective at minimizing exposure. May be useful alone or in combination with other, more active, remedial actions.	Deed restrictions are readily implementable.	Cost is considered minimal.
		Fencing	Limited effectiveness in minimizing site access. A fence cannot prevent entry into a restricted area.	Additional fencing or upgrading of existing fencing would be readily implementable.	Fencing is considered to have a minimal cost.
	Monitoring	Groundwater Monitoring	Moderately effective at monitoring sediment contamination. Surface water monitoring considered more effective.	Groundwater monitoring is currently conducted and is considered readily implementable.	Cost of performing groundwater monitoring is considered low.
		Surface Water Monitoring	Effective at monitoring contaminant release from Doane Lake sediments. Not indicative of impacts to ecological receptors.	Surface water monitoring is considered readily implementable.	Cost of surface water monitoring is considered low.
Containment	Capping	Sand/Gravel Cap	Ineffective in preventing infiltration. Would prevent contact with affected sediments, and minimize disturbances of sediments.	Moderately implementable. Short-term impact to wildlife verses benefit will need to be evaluated.	Cost for installation of a sand/gravel cap is considered low to moderate.
Removal	Excavation	Excavation	Very effective at removing limited volumes of contaminated materials.	Considered readily implementable. Excavation equipment is readily available.	Cost for excavation is relatively low.
Treatment	Physical/Chemical Treatment	Thermal Desorption	Potentially effective. Dewatering required, and treatability testing required to determine if method meets discharge standards.	Not considered implementable due to extensive dewatering required.	Cost is considered high, but may be less than other thermal technologies.
		On-Site Incineration	Very effective. The melting point of inorganic compounds can present potential treatment problems.	Readily available but permitting may cause difficulties.	Operation, maintenence, and permitting costs considered high to very high.
		Off-Site Incineration	Very effective. Few permitted facilities are available. Inorganic compounds can present potential treatment problems.	Not considered implementable for site sediments due to extensive dewatering requirements.	Cost is high due to incineration fees and transport costs.
		Slurry Phase Bioreactors	Expected to be effective. Bench or pilot studies must be conducted first.	Moderately implementable. A significant amount of mechanical equipment and labor is necessary.	Cost is considered moderate.
		Composting	Considered effective for pesticide contaminated soils. Bench or pilot studies must first be conducted.	Readily implementable, though less so than landfarming.	Cost is considered low.
		Landfarming	Potentially effective for organic compounds. Bench or pilot studies must be conducted.	Readily implementable. The site has ample space to implement this technology.	Cost is considered low.
		Solidification/Stabilization	Moderately effective for treating organics. Long-term stability of stabilizing mixtures has not been proven.	Moderately implementable. Mechanically and labor intensive. Increases waste volume. Requires excavation, treatment, and on-site replacement.	Cost is considered moderate compared to other technologies.
		Soil Washing	Most applicable when contaminates are in fine soil. It is difficult to predict the removal abilities of a full scale system.	Moderately difficult to implement due to mechanical complexity. Requires treatability testing prior to implementation.	Moderately high cost compared to other technologies. Operating cost is considered high.
		Dewatering	Effective dewatering can be accomplished to whatever level necessary. Several different mechanisms are available.	Readily implementable. Can become impracticable if large volumes of soil or sediment are required to be removed.	Cost is generally considered low.
Disposal	On-Site Disposal	Vaults	Prevents water infiltration through wastes. Provides a barrier to direct contact with wastes.	Construction of vaults is implementable. Large volumes of affected soil or sediment can make method impracticable.	Cost is considered high compared to other available technologies.
		Lined Cell	Effective for containment of sediment or soil. Monitoring and leachate collection would ensure containment of sediments.	Readily implementable, well established technology. Use of existing landfills considered much more implementable.	Cost is considered high when compared to other available technologies.
		Placement Within Cap	Potentially effective if used in conjunction with a capping technology. Minimizes importing of clean fill to construct a cap.	Readily implementable. Requires standard earth moving technologies.	Cost is considered low to moderate depending on the depth of excavation required.
	Off-Site Disposal	Subtitle C Landfill	Effective method of hazardous waste disposal. Hazardous waste landfills are commonly used for disposal.	Moderately implementable. Some contaminants are banned from landfills. Prior treatment may be necessary.	Cost considered high for large volumes of materials. May be cost effective for smaller volumes.
		Subtitle D Landfill	Appropriate only for solid waste. Not acceptable or effective for disposal of hazardous constituents in soil or sediment.	Not readily implementable. Agencies will not likely approve the use of solid waste landfills for disposal of RPAC wastes.	The cost is considered low.
In-Situ Treatment	Biological	Enhanced Biodegradation	Considered potentially effective. Would require a bench and pilot study to determine actual effectiveness.	Readily implementable. Recirculation and nutrient addition systems are relatively simple. Require a bench and pilot study.	Cost is relatively low compared to other technologies. No excavation or disposal costs.

Shading indicates technologies eliminated from further consideration.

Project# 92C0804A	RHÔNE-POULENC AG COMPANY	Second Screening of Technologies for Sediments	Figure 4-6
Woodward-Clyde Consultants	Portland, Oregon		

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RESPONSE ACTION	PROCESS OPTION	REMEDIAL TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	COST
No Action	None	Not Applicable	No action would not be effective at reducing the toxicity, mobility, volume, or exposure to contaminants.	No action is readily implementable.	As no action is taken, there is no cost.
Institutional Controls	Access Restrictions	Deed Restrictions	Effective at minimizing exposure. Useful in combination with other, more active, remedial actions.	Deed restrictions are readily implementable. Future use of the site would be limited.	Cost is considered minimal.
	Monitoring	Groundwater Monitoring	Effective at monitoring migration of groundwater contamination. Not effective at monitoring surface water.	Groundwater monitoring is currently conducted and is considered readily implementable.	Cost of performing groundwater monitoring is considered low.
Containment	Vertical Barriers	Slurry Wall	Effective in preventing horizontal groundwater and NAPL movement. Not applicable in basalt.	Implementation difficulties may depend on wall depth, alignment, and construction method.	Low to moderate cost depending on method, depth, and source of backfill.
		Sheet Piling	Moderately effective in limiting groundwater flow.	Difficult to implement due to depth of penetration necessary.	Cost is considered high compared to other physical barrier technologies available.
		Pressure Grouting	Somewhat effective in basalt fractures and interflow zones. Gaps may form in curtain. Difficult to determine if gaps are present.	Difficult to implement. Extensive mapping of fractures and interflow zones, and groundwater testing is required.	Cost is considered high.
		Deep Soil Mixing	Effective in controlling groundwater movement in alluvium.	Readily implementable. Requires a smaller working platform than a slurry wall. Can be constructed on irregular topography.	Cost is considered high.
	Hydraulic Barriers	Hydraulic Barriers	Effective in controlling downgradient groundwater flow in alluvium, less effective in basalt.	Readily implementable in alluvium and basalt. Would require long-term maintenance and treatment programs to maintain effectiveness.	Cost is considered moderate to high, due to long-term maintenance and treatment.
		Hydraulic control of North Doane Lake	Effective method for preventing further contamination of the lake surface water or sediments. Hydraulic modeling required.	Readily implementable. An ecological impact assessment would be required.	Cost is considered low.
Collection	Subsurface Drains	Interceptor Trenches	Effective in capturing site groundwater in the fill and upper alluvium.	Interceptor trenches are readily implemented to shallow depths using standard excavation techniques.	Cost is considered low to moderate for shallow depths in low permeability materials.
	Extraction	Recovery Wells	Effectiveness dependent on permeability, stratigraphy, and phase of constituents. Probably not effective at RPAC site in basalt.	Recovery wells are readily implementable at the RPAC site.	Cost is dependent on well depth. Most cost effective below depths of 30 feet.
Treatment	Biological	Bioreactors	Potentially effective if extraction or removal of groundwater is deemed necessary.	Moderately implementable. Some of the site constituents are difficult to degrade, and may require carefull maintenance of reactors.	Cost is considered moderate relative to other treatment technologies.
	Physical/Chemical	Free-Product Recovery	Effective in separating oily-phase liquids from groundwater or surface water.	Readily implementable. Commonly used at sites containing free-product.	Cost is considered low to moderate with respect to other treatment technologies.
		Air Stripping	Not considered effective for the majority of the constituents at the RPAC site.	Readily implementable. Commonly used and established technology.	Cost is considered low to moderate depending on whether off-gas treatment is required.
		Carbon Adsorption	Considered effective for the majority of the constituents at the RPAC site.	Readily implementable and available.	Cost is considered high, without some form of pretreatment.
		Ion Exchange	Poor effectiveness for the majority of the constituents at the RPAC site.	Readily implementable and available.	Cost is considered high.
		UV/Oxidation	Probably not effective. Technology is very chemical specific. Additional contaminant data from site is needed to evaluate effectiveness.	Readily implementable and available.	Cost is probalby high. More data is needed to accurately evaluate cost.
Discharge	On-Site Discharge	Infiltration Trenches	Potentially effective. Discharge water can be used to flush impacted soil or groundwater, or for hydraulic control.	Moderately to readily implementable. Reinjection requirements must be met. Trenches can clog over time.	Cost is considered low compared to other discharge options.
		Injection Wells	Potentially effective. Treated water can be discharged directly to saturated zone thus avoiding flushing of vadose zone.	Moderately to readily implementable. Susceptible to experiencing fouling problems.	Cost is considered moderate compared to other discharge options.
		Doane Lake	Moderately effective. Must meet surface water discharge standards. Ecological damage to Doane lake can occur.	Readily implementable, only if surface water discharge standards are met.	Cost is considered low.
	Off-Site Discharge	River	Potentially effective. Must meet surface water discharge standards.	Readily implementable, only if surface water discharge standards are met.	Cost is considered low.
		POTW	Potentially effective. Treatment of water is dependent on the contaminant load of the discharge water.	Moderately implementable. On-site sewer must accept the volume of discharge water. POTW facility must accept discharge.	Cost is considered moderate to high, depending on volume.
		RCRA Facility	Moderately effective. Requires trucking of water to RCRA facility, where necessary treatment will be carried out.	Difficult to implement, due to extensive trucking that would be required.	Cost is considered high to very high.
In-Situ Treatment	Biological	Enhanced Biodegredation	Potentially effective for affected groundwater. Bench and pilot studies required to determine if proper conditions can be established.	Moderately implementable. Bench or pilot study will determine overall implementability.	Cost is considered low to moderate relative to other treament technologies.
	Physical/Chemical	Air Sparging	Potentially effective for removal of volatile compounds.	Air sparging is readily implementable.	Cost is considered low to moderate, depending on the number of wells required.
		Solvent/Surfactant Addition	Effectiveness expected to be poor due to difficulty of mobilizing constituents of concern and achieving hydraulic control.	Very difficult to implement. Control of mobilized contaminants would be difficult to impossible.	Cost is considered moderate. Further treatment of mobilized contaminants would be required.

Shading indicates technologies eliminated from further consideration.

Project# 92C0804A **Woodward-Clyde Consultants**	RHÔNE-POULENC AG COMPANY Portland, Oregon	Second Screening of Technologies for Groundwater	Figure 4-7

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RESPONSE ACTION	PROCESS OPTION	REMEDIAL TECHNOLOGY	EFFECTIVENESS	IMPLEMENTABILITY	COST
No Action	None	Not Applicable	No action would not be effective at reducing the toxicity, mobility, volume, or exposure to contaminantes.	No action is readily implementable.	As no action is taken, there is no cost.
Institutional Controls	Access Restrictions	Deed Restrictions	Effective at minimizing exposure. Useful in combination with other, more active, remedial actions.	Deed restrictions are readily implementable. Future use of the site would be limited.	Cost is considered minimal.
		Fencing	Moderately effective in minimizing site access. A fence cannot prevent entry into a restricted area.	Additional fencing or upgrading of existing fencing would be readily implementable.	Fencing is considered to have a minimal cost.
	Monitoring	Groundwater Monitoring	Effective at monitoring migration of groundwater contamination. Not effective at monitoring surface water.	Groundwater monitoring is currently conducted and is considered readily implementable.	Cost of performing groundwater monitoring is considered low.
		Surface Water Monitoring	Effective at monitoring affected or potentially affected surface waters.	Surface water monitoring is considered readily implementable.	Cost of surface water monitoring is considered low.
Containment	Hydraulic Barriers	Hydraulic Barriers	Effective in controlling downgradient groundwater flow in alluvium, less effective in basalt.	Readily implementable in alluvium and basalt. Would require long-term maintenance and treatment programs to maintain effectiveness.	Cost is considered moderate to high, due to long-term maintenance and treatment.
		Hydraulic control of North Doane Lake	Effective method for preventing further contamination of the lake surface water or sediments. Hydraulic modeling required.	Readily implementable. An ecological impact assessment would be required.	Cost is considered low.
Treatment	Biological	Bioreactors	Potentially effective if extraction or removal of groundwater is deemed necessary.	Moderately implementable. Some of the site constituents are difficult to degrade, and may require careful maintenance of reactors.	Cost is considered moderate relative to other treatment technologies.
	Physical/Chemical	Carbon Adsorption	Considered effective for the majority of the constituents at the RPAC site.	Readily implementable and available.	Cost is considered high, without some form of pretreatment.
		Ion Exchange	Poor effectiveness for the majority of the constituents at the RPAC site.	Readily implementable and available.	Cost is considered high.
Discharge	On-Site Discharge	Doane Lake	Moderately effective. Must meet surface water discharge standards. Ecological damage to Doane lake can occur.	Readily implementable, only if surface water discharge standards are met.	Cost is considered low.
	Off-Site Discharge	River	Potentially effective. Must meet surface water discharge standards.	Readily implementable, only if surface water discharge standards are met.	Cost is considered low.
		POTW	Potentially effective. Treatment of water is dependent on the contaminant load of the discharge water.	Moderately implementable. On-site sewer must accept the volume of discharge water. POTW facility must accept discharge.	Cost is considered moderate to high, depending on volume.
		RCRA Facility	Moderately effective. Requires trucking of water to RCRA facility, where necessary treatment will be carried out.	Difficult to implement, due to extensive trucking that would be required.	Cost is considered high to very high.
In-Situ Treatment	Physical/Chemical	Aeration	Not effective. Volatile compounds are not expected to be present in concentrations high enough to justify this technology.	Readily implementable.	Cost is considered low.

Shading indicates technologies eliminated from further consideration.

Project# 92C0804A	RHÔNE-POULENC AG COMPANY	Second Screening of Technologies for Surface Water	Figure 4-8
Woodward-Clyde Consultants	Portland, Oregon		

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Attachment 4

DEQ February 19, 2013 Email

LACEY David

From: LACEY David
Sent: Tuesday, February 19, 2013 10:23 AM
To: 'Joan Underwood'
Cc: ANDERSON Jim M
Subject: NW Natural, Risk Assessment Work Plan Comments Letter

As we discussed last week DEQ is requesting StarLink provide iso-concentration maps as part of the Hot-Spot Identification Report. As I mentioned DEQ is also requesting this from the adjacent Gasco and Arkema sites. Attached is DEQ's review of the Gasco Human Health and Ecological Risk Assessment Work Plan. See specific comments on "Risk Assessment." As with the Gasco site, this information provides the basis for evaluating the site for hot spots of contamination, developing RAOs for specific environmental media, and identifying remedial technologies applicable to contaminated media and areas of the site. DEQ considers this information essential to the FS given the long complex operational history of the former Rhone Poulenc Facility; the multiple sources of contamination present; the variety of contaminants exhibiting a wide range of physical, chemical, and fate and transport properties; and the significant occurrence of NAPL beneath the site.

"Risk Characterization
DEQ understands from sections 7.4 and 8.4 that if an area-specific exposure point concentration (EPC) exceeds a human health or ecological soil and/or groundwater screening level, then NW Natural will assume there is unacceptable risk for that exposure pathway for the entire exposure area. DEQ believes the end-point of this approach is likely to be identification of unacceptable risk for soil and groundwater exposure pathways for all exposure areas. As indicated previously in DEQ's May 12, 2010 revisions to NW Natural's March 17, 2010 meeting summary and our October 25, 2011 letter commenting on the Draft Data Gaps FSP2, DEQ believes the risk assessment must support scoping and planning of the uplands feasibility study (FS).
For purposes of supporting FS scoping and planning, DEQ requests that NW Natural include iso-concentration maps of Gasco Site chemicals of concern (COCs) for soil and groundwater in the HERA Report. DEQ requests that each figure include information regarding sample locations, the medium, exposure pathway, and depth interval(s) depicted. For reference and completeness, analytical results for COCs should be posted on the figures at the corresponding sample location. DEQ also requests the data to be contoured using broadly accepted routines such as kriging, nearest neighbor, or similar method. The justification for the contouring method selected should also be provided in the HERA Report. Iso-concentration maps will provide information for the site to support evaluations of hot spots of contamination; development of remedial action objectives for specific environmental media; identification of remedial technologies applicable to contaminated media; and risk management decisions. DEQ considers this information essential to the FS given the long complex operational history of the former Gasco Facility; the multiple sources of contamination present; the variety of contaminants exhibiting a wide range of physical, chemical, and fate and transport properties; and the significant occurrence of DNAPL beneath the site."

Here is the final version of our comments letter regarding the Gasco Site Risk Assessment Work Plan that requests NW Natural to include iso-concentration maps in the Risk Assessment Report.

DEQ_Comments-raft_HERA_Work_P

David Lacey
Oregon Department of Environmental Quality
Northwest Region
2020 SW Fourth Ave., Suite 400
Portland, Oregon 97201-4987